

Search and learning in the Alaskan halibut fishery: Overview of the field data collection

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Abstract: This report presents an overview of the methods used to collect field data from commercial halibut fishermen in the Gulf of Alaska during the 2006 and 2007 fishing seasons. The report consists of three parts: Part I presents an overview of project goals, the survey instrument, and procedures used in the field to facilitate data collection; Part II presents summary statistics to demonstrate the breadth of information gathered; Part III discusses challenges and lessons learned during the field data collection effort.

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1. Introduction

This report describes the survey methods used to collect decision making data from fishermen operating in the Gulf of Alaska during the 2006 and 2007 fishing seasons. Part I presents an overview of project goals, the survey instrument, and methods used in the field to facilitate data collection. Part II presents summary statistics from various data sources. The goal is to demonstrate the nature and depth of information gathered. Part III discusses lessons learned, and provides recommendations for improving field data collection efforts using mobile personal digital assistant technologies.

Part I. Project goal s

The “halibut project” is funded by the National Science Foundation (project number 0527728).¹ The main goal is to provide new empirical knowledge on how people form expectations about uncertain events that affect livelihoods, and how individuals learn and make choices in uncertain environments. Several aspects of the project make it unique. First, the study participants are professional longline fishermen who search for pacific halibut (*Hippoglossus stenolepis*) in the Gulf of Alaska, primarily from the ports of Kodiak, Homer, Seward, Sitka, Yakutat, King Cove, Dutch Harbour, and Adak Alaska. The study seeks to analyze and, when possible, test theories of decision-making under uncertainty in a high-stress and high-stakes environment.

The dynamic search problem facing halibut fishermen shares features with a wide range of decision problems which can be classified as bandit problems. Fishing is in many respects a naturally occurring multiple-armed bandit problem. Professional commercial fishermen take repeat trips to sea to search or hunt for fish. The spatial location of fish is uncertain. Most fish species, however, naturally congregate in areas of preferred ocean habitat which offer the best conditions for survival and reproduction. The true location of pacific halibut is unknown. On each trip from port, fishermen must decide on the best location to set longline gear. Only when the gear is pulled from the water do fishermen observe a noisy signal of the true stock concentration at a chosen site. And only when gear is pulled is the payoff from the gear set revealed.

Fishing at a site yields an ex ante random payoff, but also information used to guide future site choices (Marcoul and Weninger, 2008). Skippers therefore have opportunity to learn and resolve uncertainty over time, i.e., within a fishing trip. Learning comes at a cost since fishing at a site that “might” have a high abundance requires time, fuel, and bait expenses, which could have been allocated at some other location.

¹ The full title is “Search, Learning and Dynamic Choice Under Uncertainty: An Empirical Analysis of Alaskan Halibut Fishermen”.

Studying the cognitive processes used to make decisions under uncertainty presents unique methodological challenges. Laboratory experiments can and have been effectively used to overcome many of these challenges (Camerer, Loewenstein and Rabin, 2004). A common criticism of decision-making in the lab is that subjects may not be sufficiently motivated to solve the decision problem presented to them; the reward for “good” decisions may be small relative to the cognitive effort involved. A second problem is that the pool of subjects, typically undergraduate students, is not representative of individuals who select professions that require and reward decision-making ability. A unique feature of the halibut project is the pool of subjects and the decision setting: halibut fishermen have selected to work in dangerous conditions where the ability to find fish is rewarded financially, and revered among members of fishing communities.

Studying dynamic choice under uncertainty in the field introduces important logistical challenges. These challenges were met with the help of personal digital assistant (PDA) technology which was used to collect real time information about fishing behavior. Fishing trips originate from ports distributed throughout the Gulf of Alaska, at dates chosen by fishermen (the halibut season begins in mid-March and ends in mid-November). Participating skippers in the study were issued a hand-held computer that contained a pre- and a post-trip questionnaire. Prior to each trip, participants answered a series of questions on the expected trip length, the location of planned fishing sites, expected catch at these sites, and expected weather conditions for the trip. When the trip was completed, participants answered a post trip questionnaire. Information on actual trip length, weather conditions on the trip, along with revenue and costs, is collected. Fishermen log books record provided information on precise fishing locations and realized catch at each location. The post-trip questionnaire determines whether or not pre-trip plans were followed, and if not, the key factors responsible for a change in plans.

The PDA technology also allows for logical structuring of survey questions. For example, one post-trip question asks if a planned fishing site, extracted from the pre-trip questionnaire, was actually fished. A “no” response is followed by a question that asks the skipper to provide a Likert scale ranking of the reasons why the site was not fished.

The next sections describe the methods used to collect the halibut project data. We describe the recruitment of study participants, development and design of the survey instrument, and the procedures used to monitor data collection in the field. Descriptive statistics for the collected data are presented.

Part 2. Survey instrument and data

Summary descriptive statistics are provided from several data sources including: (1) a pre- and post-trip survey administered via a mobile personal digital assistant technology; (2) trip-level logbook records; (3) global positioning system (GPS) data collected from mobile recording technology that was fixed to participating vessels and (4) supplemental data collected on skipper, vessel, and crew characteristics collected from an annual paper survey.

The tasks of identifying study participants and developing the survey instrument were conducted during fall 2005 through March 2006. Participants were identified and the survey instrument preparations were completed in February 2006, prior to halibut season opening in mid-March. The population of US-based halibut fishermen was identified through a public record of halibut individual fishing quota (IFQ) share owners, and from the Fishing Vessel's Owners Association.² The quota ownership record is mandated under the IFQ management program in response to fears that concentration of quota ownership could detract from the social and economic goals in the fishery (Pautzke and Oliver, 1997).³ The number of distinct fishermen or fishing firms likely exceeded 1,000 during the 2006 and 2007 season, although the exact number is not known. In 2007, the ownership registry lists 1,897 separate quota owners. However, many of these share common surnames and/or mailing addresses and likely do not represent separate entities.

Information about the halibut study was made available to halibut skippers through public media sources including web-based communications and radio interviews which aired on local Alaskan radio stations. A letter with an invitation to participate in the project was distributed by the International Pacific Halibut Commission (IPHC) which maintains a (confidential) record of mailing addresses for halibut fishermen. The most effective recruitment technique was one-on-one telephone contact initiated by the principle investigator during the fall and winter 2005. The technique involved matching names of quota owners from the public quota ownership database to publically available telephone numbers. Fishermen were contacted, given a brief description of the project and asked if they'd consider participating. Fishermen were asked the number of halibut trips they expected to make during the 2006 season. Those who expressed interest and indicated they would take five or more halibut longline trips in management areas 3A and 3B in the central Gulf of Alaska were recruited. The goal was to recruit 50 skippers for the 2006 fishing season.

A major consideration in fishermen's decision to participate in the project was the requirement to disclose sensitive information with the research team. Halibut fishermen view the locations of productive fishing sites as the single-most important determinant of fishing success and ultimately their livelihoods. Past negative experiences with regulators and researchers have caused fishermen to be guarded and generally untrusting of individuals seeking information, such as academics. Potential participants also expressed concern about the added responsibility of completing pre- and post-trip questionnaires, particularly those skippers who did not perceive themselves as computer savvy.⁴

² A list of licensed halibut fishery participants is maintained by the International Pacific Halibut Commission (IPHC) but was not available due to confidentiality restrictions. We are grateful to Robert Alverson, General Manager, and Carol Batteen, Executive Assistant for providing assistance in contacting, organizing and hosting the focus group meetings.

³ The registry is available at: <http://www.fakr.noaa.gov/ram/ifqreports.htm#qspools>

⁴ Ideally the survey instrument would have been operational prior to recruitment, which would allow potential participants opportunity to become familiar with the PDA technology and questions that would be asked. Unfortunately, that was not possible.

A formal confidentiality agreement eased concerns over the sensitive nature of information to be disclosed (see Appendix B). To compensate participating fishermen for time and effort required to answer the pre- and post-trip survey questions, each was paid \$500 per season, and offered the Dell Axim PDA as a gift. Recruitment efforts yielded a sample of 43 skippers in 2006 and 36 skippers in 2007. The number of participants is discussed further below.

Focus group meetings held in Seattle, Homer, and Kodiak in the fall 2005 and winter 2006 were conducted in the development of the survey instrument. Several goals were accomplished in these meetings. The first was to learn as much as possible about the biological, economic, regulatory, and technological elements of the pacific halibut fishery. A second goal was to learn the *language* of commercial halibut fishermen. For example, eliciting beliefs about uncertainty facing a decision maker and recording measures of uncertainty required that the survey instrument adopt terms familiar to halibut skippers. A third goal was to begin the process of developing trustful relationships between participants and the research team, and to recruit participants.

A significant number of halibut fishermen winter in the port of Seattle, WA. Meetings with groups of Seattle-based skippers were organized during the fall of 2005 at the Fishing Vessel's Owners Association office at Fisherman's terminal. In addition, a series of personal interviews were conducted with skippers operating from the ports of Homer, Kodiak, and Seward.

Focus group efforts allowed the research team to identify key questions for inclusion in the pre- and post-trip questionnaire. A paper schematic of the questionnaire is presented in Appendix D. The next section reviews the questions and presents descriptive statistics from the data that was collected.

2.1 Pre-trip questionnaire

The pre-trip questionnaire includes 22 questions. Feedback from participating skippers suggests that roughly 10 minutes was required to complete the questionnaire. Participants were asked to enter responses to pre-trip questions before each halibut or halibut/black cod combination fishing trip in 2006. In 2007, skippers were asked to record responses prior to each halibut, combination trip, and black cod trip.

The importance of completing the survey questions before embarking on a fishing trip was emphasized clearly and repeatedly to participants. Skippers understood that survey responses entered during or after a trip could not be used to answer some of the key research questions of the study.

The PDA technology records a date and time stamp of when the survey questionnaire is completed. Date and time stamps were compared to the log book record dates and GPS records to determine if the questionnaire was completed at the appropriate time.⁵

General trip questions

The pre-trip questionnaire begins with a series of general questions regarding trip plans. The skipper is asked to record the departure date and time (AM or PM), the expected trip length, the planned total harvested pounds for the trip, and expected prices for landed fish. Since fuel is loaded prior to leaving port, the skipper is asked to enter the per-gallon fuel price (question 3).

Focus group discussions indicated that skippers have an established goal for the total pounds of fish that they plan to harvest on a trip. This target is recorded in question 5. The pacific halibut fishery has been managed with individual fishing quotas (IFQs) since 1995. Legal landings must be accompanied by matching IFQ shares. Focus group discussion indicated that for some trips, total trip pounds are constrained by available quota. Question 6 asks if the total catch target for the trip is constrained by IFQ shares.

Table 1: General pre-trip plans

	2006						2007					
	N	Min.	Max.	Mean	Med.	Std.	N	Min.	Max.	Mean	Med.	Std.
Trip length	245	1.00	14.00	4.93	5.00	2.59	217	1.00	13.00	4.67	4.00	2.39
Fuel price	242	1.85	3.25	2.77	2.78	0.18	212	1.78	3.92	2.80	2.78	0.26
Trip Lbs. ('000)	242	0.01	72.00	18.76	14.50	15.85	217	0.50	300.00	23.22	20.00	25.08
Sites	245	1.00	5.00	2.10	1.00	1.47	217	1.00	5.00	2.00	2.00	1.32

There are 245 unique trip records in the 2006 data, and 255 unique trips recorded in the 2007 data. Table 1 reports summary information for halibut and combination trips for each year. The 2007 data include 38 black cod trips which are not included in table 1. Table 1 shows a wide variation in the length of fishing trips, and plans for the total pounds that will be harvested. Mean trip length is in the range of 4.5 days, but varies widely among participating skippers. Similarly, the trip pounds, i.e., the skippers goal for total harvested pounds on the trip, range widely within each year.

Table 2: Expected Halibut Prices

Weight class	2006				2007			
	N	Mean	Med.	Std.	N	Mean	Med.	Std.
10-20	117	3.42	3.30	0.39	97	4.03	4.00	0.34
20-40	125	3.48	3.45	0.43	117	4.02	4.00	0.34
40-60	118	3.86	3.80	0.55	96	4.44	4.45	0.41
60 +	126	3.90	3.85	0.44	116	4.49	4.50	0.31

⁵ The system allows for strict data quality control. Unfortunately, when a Dell Axim PDA unit loses battery power, the date and time function must be reset. In 2007, the pre-trip instrument was programmed to remind skippers to check the date on the PDA unit, and correct when necessary.

Table 2 summarizes the response to pre-trip question 4, which asks the per-pound price expected for the various halibut size classes. Sizes range 10-20 pound fish, and up to fish weighing 60+ pounds. To keep the skipper response burden low, the pre-trip survey records expected prices for two-size classes only. Trips originating on even numbered days record prices for the 10-20 and 30-40 pound size classes. Trips originating on odd numbered days record prices for the 20-30 pound and 60+ pound category. Note the price premium for large fish and the increase in average halibut prices paid between the 2006 and 2007 fishing seasons.

Site choice

An important goal of the pre-trip survey is to document the decision process used in selecting fishing sites. Focus group discussions indicated that most skippers have a particular fishing site in mind when planning a trip. On-board global positioning system technology allows the skipper to communicate the precise location, in terms of latitude and longitude, of the planned sites.⁶

Site choice is influenced by a host of factors, e.g., the site may have produced a good catch on a previous trip. Hereafter we refer to the skippers first planned fishing site choice as the primary site. Pre-trip plans typically include one or more contingency sites which can be fished in the event that the primary site does not produce and is abandoned. Factors affecting site choices along with reasons for abandoning a primary site are discussed below.

Question 7 records the number of distinct fishing sites at which the skipper expects to set gear to harvest the total pound target listed in question 5. Summary statistics are reported in table 1. Focus group meetings indicated that the interpretation of a *fishing site* was not universally clear. To promote consistency in the data, participating skippers were asked to respond to question 7, based on a formal definition provided in a supplemental study information packet.⁷

Table 3: Factors Affecting Primary Site Choice

Factor	2006				2007			
	N	Mean	L=1	L=5	N	Mean	L=1	L=5
1. Caught fish past years	243	4.09	26	137	215	3.93	36	123
2. Caught fish this year	243	2.45	133	60	213	2.51	111	59
3. Tip from a friend	243	2.04	141	19	213	1.98	128	19
4. IPHC setline survey	243	1.31	206	1	213	1.28	182	5

⁶ The wheelhouse of a typical longline vessel is equipped with sophisticated electronic equipment used for navigation, mapping the sea floor, communication, and other purposes.

⁷ Participating skippers were provided with the following description/definition of a fishing site: *Fishing sites* are locations that are separated by vessel *steaming* time with gear out of the water. For example, the first fishing site on a trip is the location at which the first set is made since the vessel steamed from port with all gear out of the water in order to reach this location. If, after making one or several sets at this first site, the gear must be completely removed from the water in order to steam to a new location, this new location will represent a distinct fishing site.

5. Good weather expected	243	3.44	28	65	214	3.46	32	60
6. Good tides expected	243	2.90	65	43	214	2.86	42	33
7. Close to fish buyer	243	2.69	86	38	213	2.60	85	39

Question 8 records the latitude and longitude of the *most likely location* of the first fishing site. Question 9 records factors that were influential in the choice of the primary fishing site. Focus group meetings revealed several factors that were regularly considered when selecting fishing locations. Question 9 uses a 5 point Likert scale to rank the importance of seven such factors.

Factors 1 asks the importance of fishing success in past years, and factor 2 asks the importance of fishing success in the current year. The third factor asks the importance of information provided by other fisherman. Focus group discussions indicated that halibut skippers occasionally review a publically available setline survey conducted by the IPHC. This data records the catch per standardized skate on a fixed latitude and longitude grid in the Gulf of Alaska. Factors 5 and 6 ask the importance of weather and tide conditions in selecting the primary site. Factor 7 asks the importance of the proximity to a fish buyer.

To give an idea of what factors skippers used in selecting fishing locations, table 3 reports the sample mean for the Likert scale responses, along with the number of “not important” (L=1) and “very important” (L=5) responses. The summary information indicates that past fishing success in past years, and to a lesser degree earlier in the current year is an important factor in site selection. Weather, tides, and location to the fish buyer play a role. Tips from other skippers and IPHC setline data influence site choices less often. Comparison of 2006 and 2007 summary information indicates only minor differences.

Skippers were asked the importance of factors influencing their secondary site choice. The information gathered is qualitatively similar to the results in table 3, and to save space is not reported here.

Effort and catch

The goals of questions 10-12 are to control for heterogeneity in the gear used by participating skippers, and to prepare respondents for upcoming questions which ask skippers to think about and record catch expectations. Focus group meetings revealed that in some instances skippers select a site they feel will yield a particular size class of fish. In response to downstream market pressures, fish buyers may ask that a skipper target and deliver a particular size class of fish. Question 10 asks the size class of fish most likely to be intercepted at the planned primary fishing site.⁸

⁸ Discussions with skippers during focus group meetings indicate uneasiness with the targeted size class question. The concern was that information collected would be used to accuse fishermen of high-grading, i.e., discarding fish that fall outside a particular size class that was targeted on the trip. We did our best to assure fishermen that the question would be used to investigate the implications of the size class target on site choices.

Table 4: Most likely size class at planned sites (% of sample trips)

Weight class	2006 (N=245)				2007 (N=215)			
	Primary		Secondary		Primary		Secondary	
	trips	%	trips	%	trips	%	trips	%
10-20 Lb.	35	14.4	46	19.5	41	19.1	45	21.3
20-40 Lb.	157	64.6	150	63.6	154	71.6	144	68.3
40-60 Lb.	48	19.8	36	15.3	18	8.4	19	9.0
60+ Lb.	3	1.2	4	1.7	2	0.9	3	1.4

Table 4 summarizes responses to the question asking the most likely size class at the primary and secondary site. On roughly 65% or more of trips, skippers expect to intercept halibut in the 20-40 size class. On about 20% of the trips, skippers expect to intercept 10-20 pound size class fish. Differences between 2006 and 2007 size expectations are minor.

Regulations in the halibut fishery require fishermen to report harvests, and the number of skates employed at site at which gear is set. The catch-per-skate may be proportional to abundance and is therefore a commonly used measure of stock abundance. The term “catch-per-skate” is familiar to commercial halibut fishermen, used regularly to convey information about the productivity of fishing sites. Catch per skate is also an important determinant of profits earned by fishermen.

Pre-trip question 11 records the number of hooks per skate. Question 12 records the number of skates the skipper plans to set at the primary fishing site. Questions 13 and 14 record ex ante expectations about catch per skate at the primary fishing site. In question 13, the skipper is asked to record the average pounds per skate that is expected on the skates (inserted from question 12) that are planned at the primary site. The wording of this question is chosen to solicit the arithmetic mean catch per skate for a fixed amount of gear.

Table 5: Planned effort and catch per skate at the primary site

	2006					2007				
	N	Min.	Max.	Mean	Std.	N	Min.	Max.	Mean	Std.
Hooks/skate	243	25.00	720.00	123.36	72.53	215	50.00	750.00	122.83	79.06
Skates	242	1.00	500.00	53.42	69.24	215	2.00	360.00	67.83	77.94
'000 hooks	243	0.08	90.00	7.03	11.58	215	0.16	62.50	8.81	12.24
Pds./skate	243	5.00	5,500.00	308.46	506.55	214	20.00	1,000.00	241.75	142.58
Wind (kph)	244	5.00	45.00	24.00	7.54	214	10.00	45.00	22.01	6.33

Table 5 shows wide variation in the total fishing effort (hooks) that are planned, and catch-per-skate expected at primary fishing sites. The planned number of skates set at primary sites ranges from 1-500 in 2006, and from 2-360 in 2007. Total hooks range from 80-90,000 in 2006, and from 160-62,500 in 2007.

Comparison across the two years reveals an increase in the planned effort at primary sites in 2007. Sample average number of skates increased from 53.42 to 67.83, and total hooks increased from 7,030 to 8,810. The sample average pounds per skate expected at the primary site is 308.46 in 2006 to 241.75 in 2007. Keep in mind that the differences in sample averages reflect changes in the composition of skippers participating in the study.

Question 15 of the pre-trip survey records a measure of perceived danger on a planned fishing trip. Focus group discussions revealed that wind speed is highly correlated with wave height, which is a source of danger including possible vessel sinking. Question 15 records the highest expected sustained wind speed at the primary site. Sustained wind speed was defined as winds lasting for a period of at least 6 hours. Table 5 summarizes the responses to wind speed expectations.

Catch-per-skate distribution

Halibut fishermen do not know the stock abundance that will be encountered by their gear at sites chosen for fishing. Ex ante, the catch-per-skate is a random variable. Question 14 records information about the pre-trip catch per skate random distribution as perceived by the respondent. A series of four “chances” questions are asked:

- a. What are the chances that the catch per skate will be less than T1 pounds?
- b. What are the chances that the catch per skate will be less than T2 pounds?
- c. What are the chances that the catch per skate will be above T3 pounds?
- d. What are the chances that the catch per skate will be above T4 pounds?

In the above, T1-T4 denote integer-valued threshold points on the range of the catch-per-skate distribution. The thresholds satisfy $T1 > T2$ and $T3 < T4$. They are calculated as a function of the average expected catch-per-skate value entered by the respondent in question 13.

The threshold value that is asked affects what can be learned by the research team about a perceived catch-per-skate distribution. A particularly low or high threshold can invoke a *chances* response near zero. A zero response bounds the support of the catch-per-skate distribution, but provides less information about the shape of the catch-per-skate distribution.

Threshold values were established from an analysis of 1998-2005 IPHC setline survey data. Year- and station-specific moments of the IPHC setline survey catch-per-skate distribution were first calculated. This analysis indicated a strong relationship between the mean and standard deviation of catch-per-skate with standard deviation equal to roughly 1/3 of the mean value.

In 2006, the outer threshold values (parts a. and c.) were set at 5% and 175% of the mean catch-per-skate reported by the skipper (question 13). Inner thresholds (parts b. and d.) were set at 25% and 150% of the mean. Additional details of threshold formulas are reported in appendix C.

Examination of the 2006 responses indicated smaller than expected differences in the chances responses. In 2007, the threshold value calculations were modified so that threshold values depend on the response to question 13 and the entered chances responses. See Appendix C for additional details.

The PDA questionnaire prompted skippers to check responses when chances entered violated the law of probability. For example, if skipper entered a 10/100 chance that catch-per-skate will be below T1 and subsequently entered a 5/100 that the catch will be less than T2 ($>T1$), the survey instrument prompted the skipper to check their answer.

Contingency site

Focus group meetings revealed that skippers regularly have one or more contingency sites in mind when planning a fishing trip. Conditions can arise where the primary site cannot be fished or does not produce the expected catch-per-skate. In this case, the skipper moves to a second fishing site.

Question 16 of the pre-trip survey asks, “If you do not catch all [planned] pounds at the first site, where planned pounds is recalled from question 5 of the pre-trip survey, what is the most likely location of your second site?” The survey then repeats questions 8-15 (latitude and longitude, reasons for selecting the site, gear, expected catch, and weather conditions) for the *secondary* fishing site. Skippers may have multiple contingency sites in mind when planning a fishing trip. Asking skippers to enter data for a third contingency site could result in lower effort devoted to all survey questions. The pre-trip survey ends when respondents have entered information regarding the secondary site.

When secondary site responses are completed, the skipper is reminded to turn on the GPS plotter.

2.2 Post-trip questionnaire

At the end of the trip, study participants complete a post-trip questionnaire administered on the PDA unit. The goals of the post-trip survey are to determine if pre-trip plans were followed, record reasons why plans may have changed, and collect trip revenue and cost information.

Question 1 of the post trip survey records the number of days at sea for the trip. If the trip length was less than indicated in the pre-trip survey (response to question 2 of the pre-trip survey), the skipper is asked to rate the importance of seven factors in causing the early return: (1) more fish than expected, (2) weather, (3) ran out of bait, (4) ran out of ice, (5) mechanical problem, (6) health problem/injury, (7) lost gear.

If trip length exceeded pre-trip expectations, the skipper is asked to rate the importance of four factors in the delay of the trip: (1) fewer fish than expected, (2) weather, (3) mechanical problem and, (4) lost gear. Responses were recorded on a 5 point Likert scale which ranged from “1 - not important” to “5 - very important.”

Table 6: Importance of factors causing early return

	2006				2007			
	N	Mean	L=1	L=5	N	Mean	L=1	L=5
1. More fish than expected	71	2.72	31	19	52	2.60	26	13
2. Weather	71	2.77	31	22	54	2.69	26	15
3. Ran out of bait	70	1.40	69	5	53	1.66	42	6
4. Ran out of ice	70	1.49	56	4	52	1.62	41	4
5. Mechanical problem	72	1.32	63	3	54	1.43	47	5
6. Health problem/injury	71	1.18	66	1	54	1.11	52	1
7. Lost gear	71	1.07	68	0	54	1.17	51	1

Table 7: Importance of factors causing late return

	2006				2007			
	N	Mean	L=1	L=5	N	Mean	L=1	L=5
1. Fewer fish than expected	55	3.62	12	24	41	3.73	8	19
2. Weather	57	2.79	24	17	41	3.15	14	13
3. Mechanical problem	55	1.15	52	1	39	1.18	37	1
4. Lost gear	55	1.16	52	1	40	1.08	39	0

Tables 6 and 7 reveal that stock abundance and weather conditions play a key role in causing changes in planned trip length. Poor weather makes it difficult to retrieve (pull) longline gear, and under severe winds fishing may stop altogether. Good weather has the opposite effect. In 2006, roughly 28% of the trips ended earlier than anticipated due to better than expected fishing and better than expected weather conditions. In 2007, roughly 24% of the trips ended early for similar reasons.

Table 7 indicates that lower-than-expected abundance and weather are the main factors in delaying a return to port. In 2006, 22% of trips were delayed and in 2007, 19% of trips were delayed.

The remaining factors play less of a role in determining trip length. Running out of ice or bait is presumably economically costly, and not surprisingly is not a frequent event. If gear is lost, or a mechanical or health problem arises, a return trip to port may be necessary.

In post-trip question 4, the questionnaire software recalls the latitude and longitude that was entered as the primary fishing location, and asks if the skipper set gear at this site. If the answer is “no” the skipper is asked to rate of the importance of six factors in the decision *not* to set gear at the primary site. These factors include: 1. weather, 2. tides, 3. another halibut boat on the site, 4. gear conflict, 5. friend said site had no fish, 6. whales.

A skipper may choose to move to a secondary site if another fisherman is fishing at the original destination. The term “gear conflict” is used when a gear other than fixed longline gear is already present at a site. Trawl fishermen (in pursuit of other species)

drag a large net along the sea bottom. If a trawl net becomes tangled with longline gear, time gear can be lost.

Killer whales have become very adept at recognizing the sound of a hydraulic winch used to retrieve longline gear from the ocean bottom. A pod of killer whales can snatch most of the halibut from the baited hooks attached to the longline. Longline fishing in the vicinity of hungry killer whales is to be avoided. A skipper who arrives at a planned site and finds killer whales will surely move to a secondary site. Summary statistics for the response to factors influencing site choices are presented in table 8.

Table 8: Importance of factors causing abandonment of primary site

	2006				2007			
	N	Mean	L=1	L=5	N	Mean	L=1	L=5
1. Weather	27	3.04	12	11	30	2.83	15	12
2. Tides	27	1.93	17	2	30	2.30	15	5
3. Another halibut boat on-site	27	2.26	18	7	30	1.53	25	3
4. Gear conflict	27	2.04	17	3	30	1.23	27	1
5. Friend said site had no fish	27	1.56	22	2	30	1.07	29	0
6. Whales	27	1.26	25	1	30	1.20	28	1

Halibut skippers use electronic equipment to map the relief of the sea floor. Experienced skippers are able to recognize preferred halibut habitat, which they colloquially describe as “bumpy bottom.” We were informed during focus group meetings that on occasion a skipper who is steaming in a new area may come across such bottom and set gear to determine if, in fact, halibut are present. Other factors may also play a role in the decision to set gear at an un-planned site. Question 8 of the post-trip survey asks whether, on the trip, gear was set at any un-planned site. If the response is “yes” the skipper is asked to rate the importance of four factors in the decision to set gear at the site: (1) friend said site had fish, (2) another boat catching fish at site, (3) site had good bottom, and (4) weather. Table 9 reports summary statistics for factors influencing decision to set at an unplanned site.

Table 9: Importance of factors causing an unplanned set

	2006				2007			
	N	Mean	L=1	L=5	N	Mean	L=1	L=5
1. Friend said site had fish	102	1.85	70	8	90	1.63	64	3
2. Another boat ... at site	102	1.51	82	4	90	1.33	75	3
3. Site had good bottom	103	3.99	10	49	91	3.74	15	37
4. Weather	103	3.13	33	30	91	3.47	24	41

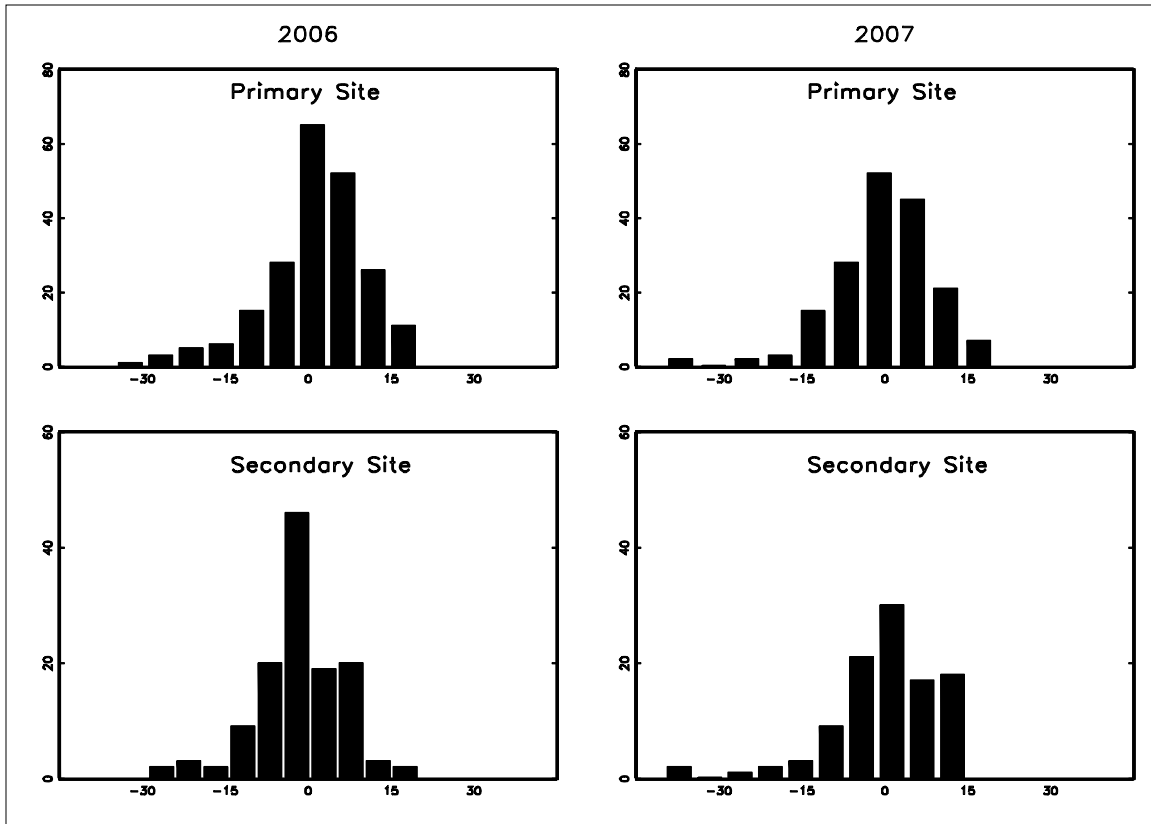


Figure 1: Bias in wind speed expectations. Top (bottom) panels are a histogram of expected minus realized wind speed a primary (secondary) fishing site. Left hand panels report 2006 data. Right-hand panels report 2007 data.

Weather expectations

If the primary or secondary site entered in the pre-trip questionnaire is fished, the skipper is asked to record the highest sustained wind speed actually encountered at the sites. The 2006 data contain 212 wind speed records at fished primary sites. In 2007, there are 175 records of realized wind speeds at primary sites. The data contain 126 (2006) and 103 (2007) records of realized wind speeds at secondary fishing sites.

These records can be compared with pre-trip expectations to assess the extent to which unanticipated good or bad weather may have altered pre-trip plans. Figure 1 reports a histogram of the pre-trip expected wind speed minus the realized wind speed. Positive values indicate unexpected fair weather, whereas negative values indicate unexpected poor weather.

Prices, revenue and trip costs

Table 10 below reports summary statistics for post-trip question 11 which asks skippers to record the actual prices received for their catch.

Table 10: Halibut prices by weight class

Weight class	2006				2007			
	N	Mean	Med.	Std.	N	Mean	Med.	Std.
10-20	230	3.46	3.45	0.40	202	4.01	4.00	0.27
20-40	232	3.74	3.70	0.45	201	4.29	4.25	0.30
40-60	229	4.00	4.00	0.48	201	4.54	4.50	0.28
60 +	221	4.02	4.00	0.43	196	4.55	4.50	0.28

As with weather conditions, realized prices can be compared with pre-trip expectations to determine the direction and extent of bias. Table 11 reports summary statistics by weight class for the difference between the skipper's pre-trip price expectation and the post-trip price realization. Recall that the pre-trip survey records expected prices for two size classes only, and therefore differences are calculated for roughly half the total trip observations in each year.

Table 11: Expected and actual prices

Weight class	2006				2007			
	N	Mean	Med.	Std.	N	Mean	Med.	Std.
10-20	110	-0.06	0.00	0.24	90	0.02	0.00	0.25
20-40	118	-0.25	-0.25	0.41	112	-0.28	-0.30	0.30
40-60	110	-0.13	-0.10	0.47	88	-0.09	-0.02	0.41
60 +	114	-0.10	-0.05	0.35	109	-0.07	-0.05	0.19

The results in table 11 suggest that participating skippers tend to underestimate the prices they will receive for their harvest.

Table 12: Per-trip revenue and costs

	2006				2007			
	N	Mean	Med.	Std.	N	Mean	Med.	Std.
Halibut revenue	233	56,903	33,046	57,582	207	69,608	50,000	64,663
Non-halibut revenue	233	13,089	185	31,127	207	13,473	350	32,586
Total revenue	233	69,992	51,000	62,397	207	83,082	65,000	68,148
Fuel Expense	228	1,842	1,200	1,905	196	1,757	1,345	1,685
Bait Exp.	232	1,134	638	1,180	206	1,153	700	1,093
Food Exp.	233	471	300	464	208	467	280	458
Value of lost gear	94	602	250	1,090	103	631	300	1,995

Questions 13-17 of the post-trip questionnaire record trip revenues and expenses. Skippers record the gallons of fuel used on the trip, the replacement cost of any lost gear as well as grocery expenses for the captain and crew. Fuel expenses are calculated as the product of the gallons burned and the fuel price recorded in the pre-trip survey. Bait expenses are recorded by bait type. Summary statistics for trip revenues and costs are reported in table 12.

The distribution of bait expenses across bait types remained stable during the 2006 and 2007 fishing seasons. In 2006, herring accounted for the largest share of bait (30%), followed by squid (28%), pollock (24%), and salmon (12%). Octopus, cod, and "other" bait types accounted for the remaining 5% of bait expenses. In 2007, squid accounted for

the largest share of bait expenses (39%), followed by herring (26%), pollock (20%), and salmon (12%). Octopus, cod, and other bait types accounted for the remaining 3% of the bait expense.

2.3 Log book records

Vessel skippers keep precise log book records of the locations at which gear is set. Log book records are used by fishermen to track productive and non-productive fishing sites and by IPHC staff to record total fishing mortality across space and time in the fishery. A typical record includes the latitude, longitude, and the depth at the beginning and end of each set. The beginning and end date and time of the set is often recorded. The quantity harvested, almost always in pounds, is recorded.

Information from participants' log book records was entered into an electronic database. In 2006, the data contained records for 308 trips, and 2,857 sets made by 37 skippers. In 2007, records are available for 316 trips, and 3,261 sets made by 36 skippers. The increased activity in 2007 is due, in part, to the addition of trips that targeted black cod exclusively. Black cod only trips are not included in the 2006 data.

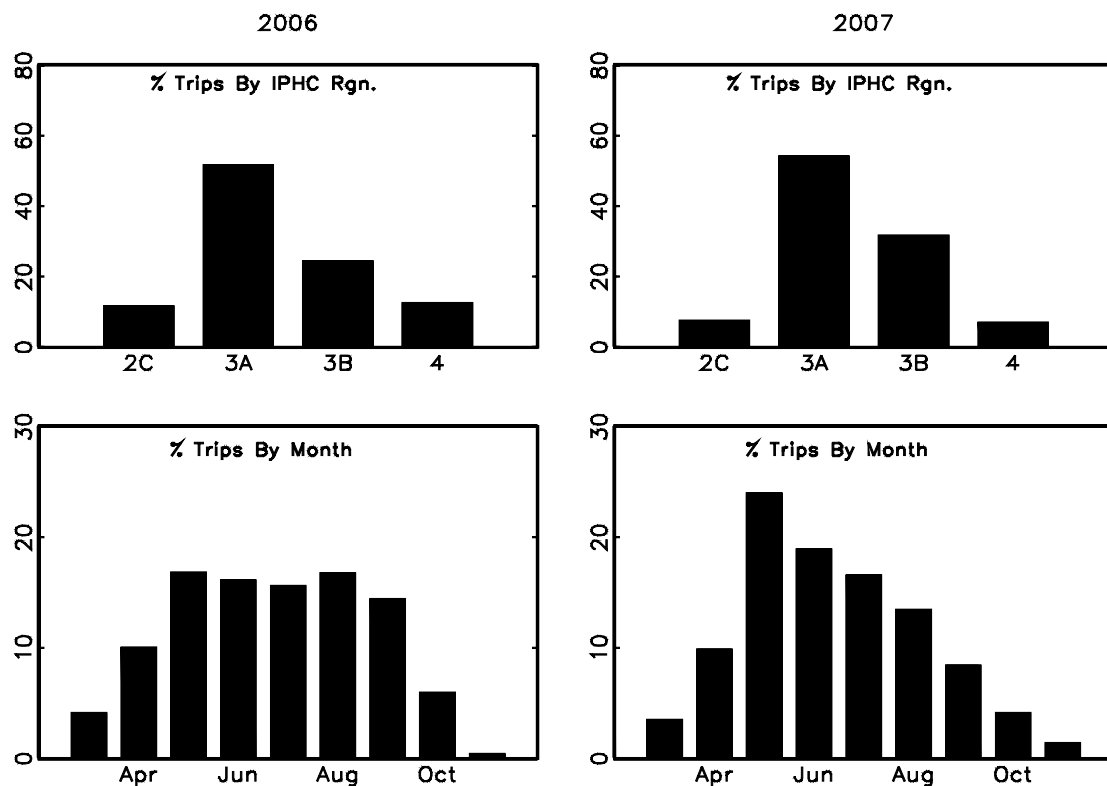


Figure 2: Logbook trips by IPHC region and month. The top panels report the percent trips in IPHC regions 2C, 3A, 3B, and 4. Lower panels report the percentage of trips by month. The left panels report 2006 data (308 trips). The right panels report 2007 data (316 trips).

Figure 2 reports log book fishing activity. The top panels report a histogram of trips across IPHC management regions. 2006 trips are shown in the left panels, and 2007 trips in the right panels. Halibut quota is designated by IPHC region. Consequently, there is little difference in trip location concentration across years. In both years, over 60% of the sample trips are taken in region 3A. Region 3B accounts for over 20% of the sample trips.

Discussions with skippers suggest that the pattern of trips observed throughout the 2006 season is fairly typical. The fishery is open from March through November. The bulk of the fishing activity takes place during the favorable summer weather conditions in May through September, as weather in early spring or late fall can be severe and unpredictable.

The temporal fishing pattern changed notably in 2007. Study participants indicated the cause was poor weather conditions in the spring of 2007.

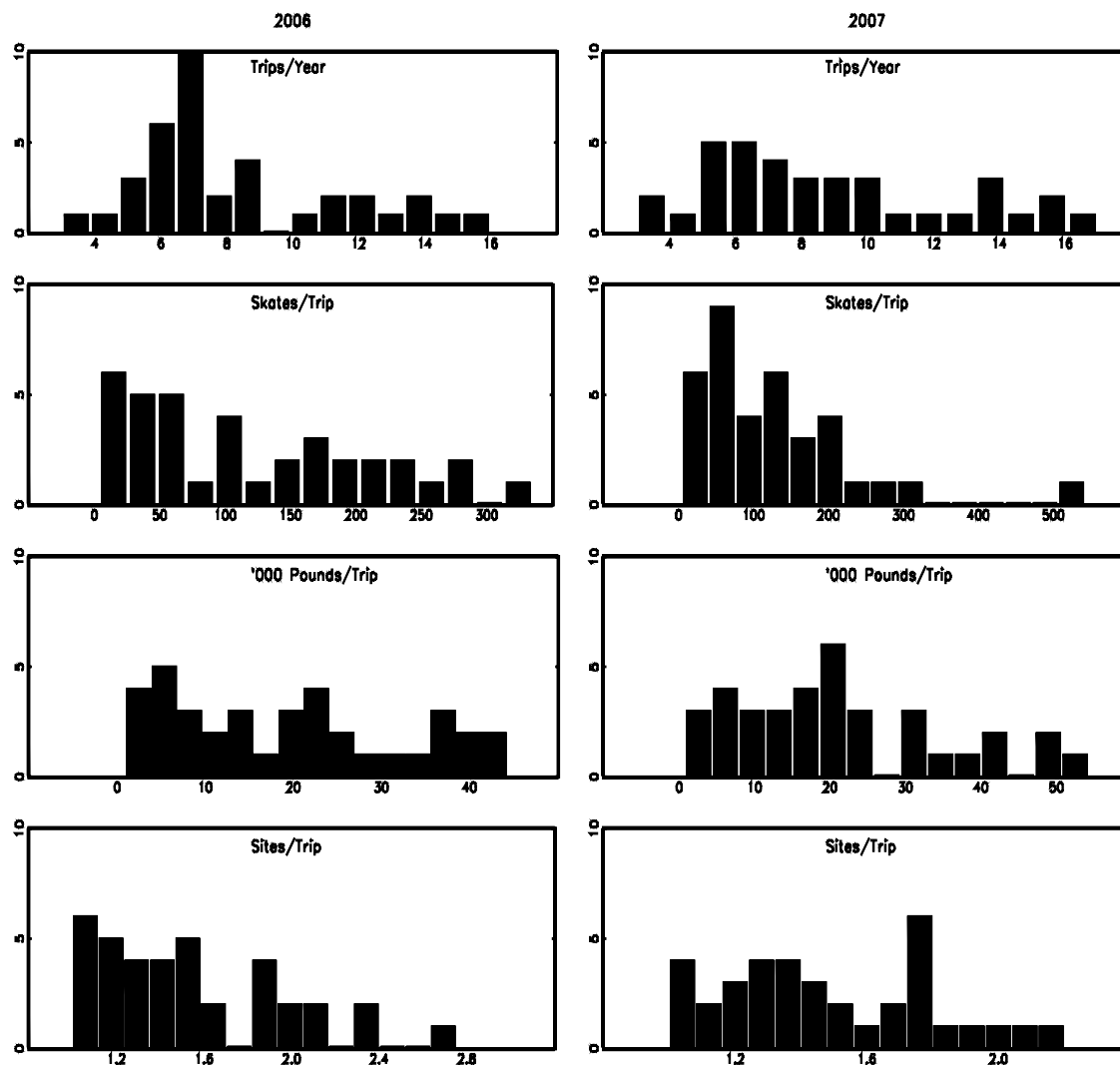


Figure 3: Skipper descriptive statistics I. The first row panels show trips per skipper. The remaining data are per skipper average values. The second row panels report average skates per trip. The third row panels report average pounds ('000) per trip.

Trip heterogeneity

Figure 3 further summarizes the logbook records and demonstrates significant heterogeneity across skippers at the trip level. The top panel reports trips per year by participating skippers. In 2006, trips per year ranged from 3 to 15. Trips per year in 2007 indicate similar variation across skippers.

The second row panels in figure 3 depict the average number of skates per trip. The range is wide, from less than 5 to over 300 skates in 2006, and from less than 5 to over 500 skates in 2007.

A histogram of skipper average catch in pounds per trip (halibut plus black cod pounds) is reported in the third row panels.⁹ In 2006, the range is from roughly 1,000 pounds per trip to over 44,000 pounds. In 2007, the range varies from less than 1,000 pounds per trip to over 50,000 pounds per trip.

The bottom panels in figure 3 report the skipper average number of sites visited on a fishing trip. Sites are identified using cluster analysis under the centroid method.¹⁰ The figure shows that 4-6 skippers depending on the year, regularly visit a single site on each trip from port. Other skippers regularly visit multiple sites on each trip. The most mobile skippers average over two sites per trip.

⁹ Most skippers record an estimate of the pounds recovered from each gear set. Of the 6,118 log book set record, 6.55% for halibut and 0.92% for black cod sets recorded numbers of fish only. For these observations median per fish weights were inserted to convert numbers to pounds harvested (797 observations, 13.0% of log book set records include both weight and fish numbers).

¹⁰ Each set corresponds to a beginning and ending latitude and longitude record. Distances between fishing “sites” was determined by varying cluster distances, by five kilometer increments, until the number of identified sites stabilized. Distances between clusters varied from 15 kilometers to 55 kilometers.

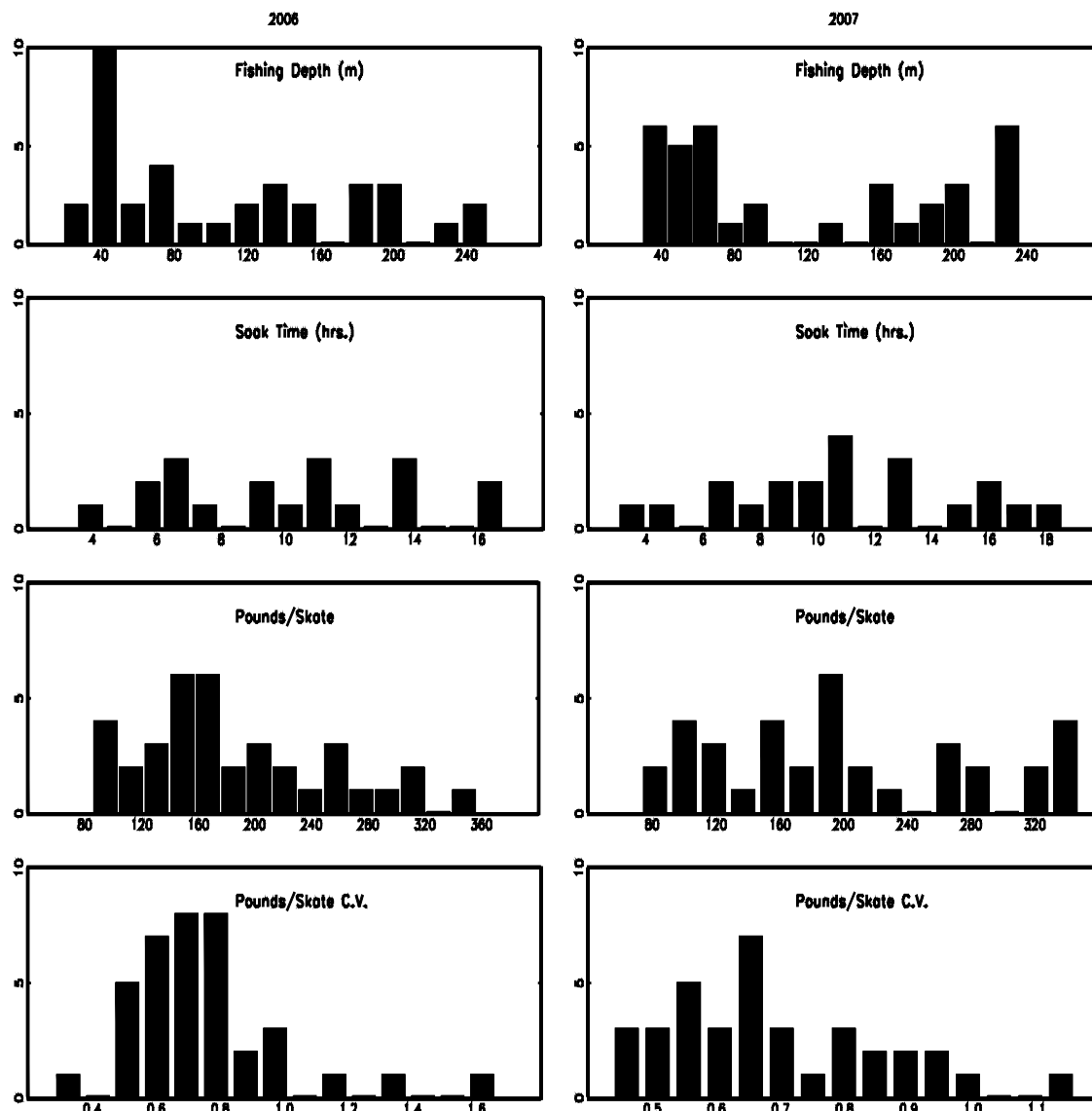


Figure 4: Skipper descriptive statistics II. The first row panels show per-skipper average fishing depths (in fathoms). The second row panels show per-skipper average soak times. The third row panels report average per-skipper pounds per skate. The bottom panels report average sites visited per trip. The left hand panels report 2006 data. The right hand panels report 2007 data.

Figure 4 presents additional information about fishing activity. The top panel reports per-skipper average fishing depths. Again the data indicate considerable variation across sample skippers with some tending to fish in depths less than 30 fathoms while others prefer depths in excess of 250 fathoms.

Most but not all fishermen record the beginning and end time of each set. Second row panels in figure 4 report skipper average soak times. Soak times are typically 10 hours, but vary across fishermen.

Heterogeneity in fishing success is reflected in the by-skipper average pounds per skate. The third row panels of figure 4 illustrate. Note that some variation across fishermen is due to differences in gear type; e.g., the number and spacing of hooks. Skipper average pounds per skate vary from less than 100 to over 300 pounds.

The bottom panel of Figure 4 reports a skipper-specific coefficient of variation, (the ratio of the standard deviation and mean catch per skate). Standard deviation exceeds the mean for several fishermen in 2006 indicating wide variation in fishing success. In 2007, the coefficient of variation is smaller for several skippers.

2.4 GPS data

Participating skippers carried a GPS tracking device during fishing operations. The technology gathers an encoded satellite signal at prescribed intervals. In 2006, a record was made every three minutes. During the 2007 fishing season, the record was on five minute intervals. Each data point records the date, time, latitude and longitude of the device, which was fixed to the participants' vessel. Distances between readings and travel speed is easily calculated.

GPS data was linked to logbook records to obtain precise starting and ending ports, total duration of each trip and the total distance travelled. The GPS data contain complete records for 262 trips.

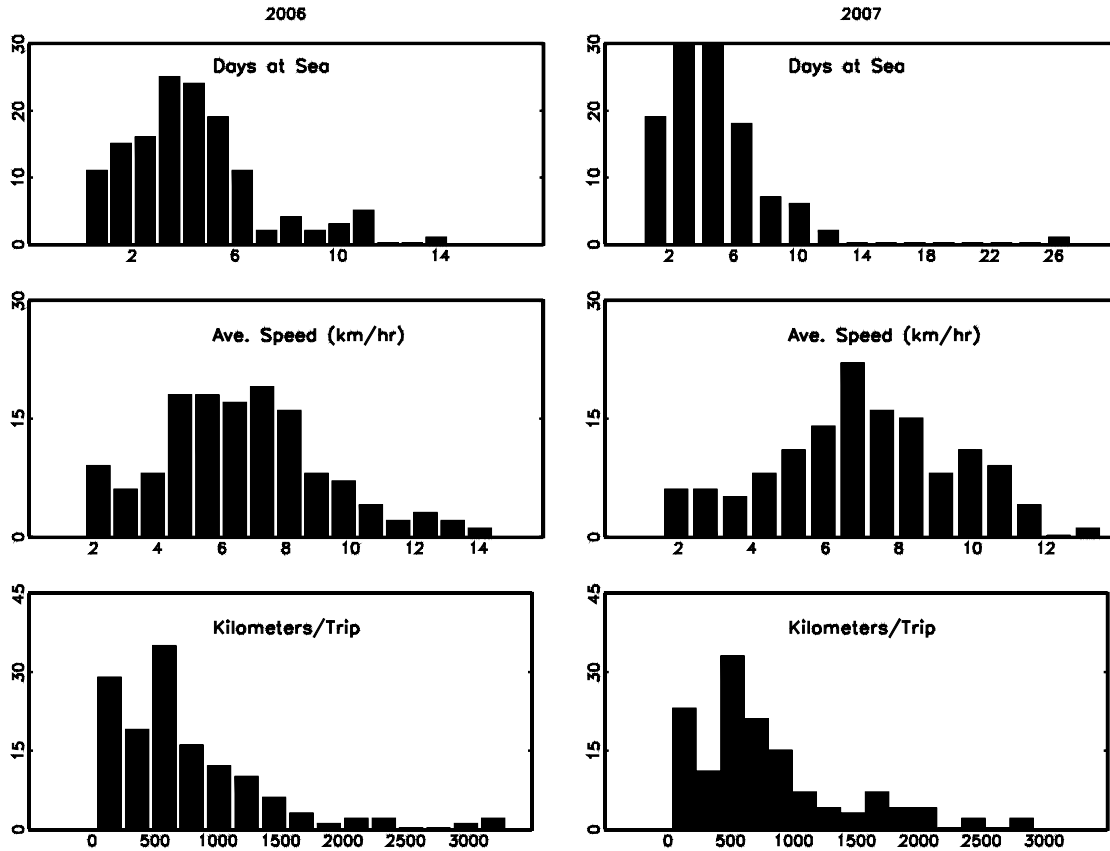


Figure 5: GPS per-trip descriptive statistics. The top panels report by-skipper average length of trips in days. The middle panels report vessel average speed in kilometers per hour. The bottom panels report by-skipper average kilometers traveled per trip, and total kilometers traveled on the trip.

2.5 Supplementary data

Table 13. Skipper and vessel supplemental information

	2006				2007			
	N	Mean	Med.	Std.	N	Mean	Med.	Std.
Years fishing	34	29.24	28.00	10.36	36	29.69	29.00	10.51
Years as skipper	36	18.17	20.00	9.41	36	18.67	20.00	9.12
Vessel Length	37	53.05	54.00	14.66	35	56.09	58.00	12.96
Engine horse power	36	383.25	350.00	158.22	35	402.23	365.00	166.84
Vessel Age	37	28.97	26.00	17.97	36	29.71	27.00	17.18
Vessel value (\$000)	37	373.51	240.00	472.23	36	465.90	300.00	502.81
Crew Size	38	3.45	4.00	1.48	36	3.28	3.00	1.37

In each year of the study, participating fishermen were asked to provide additional information about themselves, their vessel and crew. Table 13 reports summary statistics.

Additional vessel information not reported in table 13 includes hull construction: over 75% of vessels are constructed from steel or fiberglass hulls. The rest are built on wood or aluminum hulls. Five sample vessels are equipped with an automatic baiting machine.

In 2006, 70% of participating skippers indicate they share information about the location of fishing sites with other skippers. The median size of the information sharing groups is four individuals which includes the participating skipper plus three others. In 2007, 50% of the participating fishermen indicated they belong to an information sharing group; the median information-sharing group size in 2007 was also four fishermen.

The age and experience of each crew collected were collected for each year of the study. In 2007, detailed information regarding the crew remunerations was obtained. Over 90% of the participating skippers remunerate the crew via a crew share. The form of the crew share varies considerably. A typical share system takes the trip revenues and deducts various trip expenses. Each crew member then receives a share of the residual. The share returned to individual crew members varies considerably depending on their duties onboard the vessel.

Seventy-five percent of participating skippers deduct fuel and bait expenses from trip revenues. Sixty one percent deduct trip food expenses, and 50% deduct other expenses such as landings tax and a quota rental price. Our data indicate the average share returned to the “first” member, i.e., the individual with the most responsibility, is 12%. Sample mean shares for the second through fifth crew member range from 10.37% down to 8.33%.

Part 3. Challenges and lessons learned

This section discusses the challenges encountered in identifying and recruiting study participants, the design and implementation of the survey instrument, and the field data collection effort.

Sensitivity of halibut commercial fishing data presents a significant obstacle to recruiting study participants. Halibut fishermen are heavily regulated and are reluctant to share information about their business operations with regulators or the scientific community. Fishermen guard the locations of productive fishing sites.

Cooperation from fishing vessel associations based out of Washington state and Alaska was helpful in identifying potential participants and organizing focus group meetings.

The development of a project web site, interviews that aired on Alaskan radio stations, appearances at International Pacific Halibut Commission meetings, and trips to halibut ports to discuss the project goals with fishermen played a key role in identifying and recruiting participants. Written assurance that data would be secure and confidential also helped to build trust. The reputation of Iowa State University, the Center for Survey and Statistical Methodology, and in particular the National Science Foundation helped convey a standard of scientific quality. Nonetheless, some fishermen chose not to

participate because of the sensitive nature of the information that would be passed to the research team.

Halibut skippers from Alaska, Washington, and Oregon participated in the project. In some cases the opportunity to meet with a participating skipper to answer questions about the goals of the study, the procedures used to collect data, the PDA devices, or the pre- and post-trip questionnaire did not arise. Telephone contact was an effective alternative. However, face to face meetings may build a trust between the research team and participant that was not possible through telephone interaction.

Soliciting survey response in the field forfeits an element of control over the data collection process. The halibut study relied on a promise by each participant to regularly enter pre- and post-trip survey responses, share log book records and fill out year-end survey responses. Electronic equipment had to be returned between seasons for final data retrieval and updating. Most study participants completed all required tasks. Individuals who did not fully engage in the project requirements were replaced. These individuals were identified after the 2006 season was complete. It was not possible to transfer their survey instrument to other skippers in time to collect a complete season's data. Three skippers did not exert adequate effort in completing survey questions, and were removed from the 2006 sample.

The PDA technology records a time stamp when a survey questionnaire is completed. Time stamps were an effective technique to assure data quality. Multiple data sources, including PDA survey responses, logbook records, and GPS records were cross referenced to identify anomalies and further guarantee the quality of the data.

Commercial fishing on the Bearing Sea presents a high risk and at times dangerous environment for field data collection. In 2006, a set of survey equipment, Dell Axim PDA and GPS tracking device, was lost when a study participant's vessel caught fire and was burned. In 2006, a second skipper suffered a serious medical problem while steaming from Washington state to Alaska to begin fishing. This individual could not fish during the 2006 season. A 2006 participant spent the first few months of the 2007 season preparing a new vessel he had purchased. He also was forced to bow out. In 2007, a study participant suffered a mid-season heart attack, causing an early end to his fishing season.

Cooperation from the IPHC director and staff was extremely helpful. The IPHC staff helped to identify and communicate with the population of halibut fishermen. IPHC field agents collect landings data at major halibut fishing ports in the Gulf of Alaska. These agents assisted in the data collection during each season. Meetings were held with IPHC field staff in the spring of 2005, and again via teleconferencing in the spring of 2006. Field agents were briefed on the goals of the halibut project, and the operation of Dell PDA devices. Field agents collected PDA memory cards from the PDA units issued to participating skippers. The research team was concerned that data stored on PDA devices could be lost if, for example, the memory failed or the unit was physically damaged.

Memory cards were mailed directly to the CSSM for data retrieval. The IPHC field agents also provided a field presence that was otherwise not possible.

The Center for Statistical Surveys and Methodology provided programming expertise and experience in the development of the survey instrument. The PDA technology expands the nature and logical structure of survey questions. It may also remove bias that can affect surveys administered in person.

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Appendix A: Project Summary

DRU - SEARCH, LEARNING AND DYNAMIC CHOICE UNDER UNCERTAINTY: AN EMPIRICAL ANALYSIS OF ALASKAN HALIBUT FISHERMEN

PROJECT SUMMARY

Goal: The goal of this project is to provide new empirical knowledge about how people form expectations about uncertain events that affect their lives, and how people learn and make choices in situations that require decision-making under uncertainty. We will study real-world decision-making in a dynamic, high stress, and highly uncertain search environment to answer these and related questions.

Approach: We will record the subjective beliefs about catch expectations, the actual catch, and the fishing site choices (spatial search strategies) of professional halibut fishermen as they hunt their quarry in the Gulf of Alaska. The most important skill of these commercial fishermen is the ability to gather, process, organize and act on information about the location of the fish they pursue. The decision of where to fish is a critical determinant of the profitability of a vessel operation. The catch at a chosen site informs fishermen about the site's true stock abundance and profitability. Fishermen make repeated trips in search of fish, and *learn* as fishing takes place. Commercial fishermen thus face a complex dynamic search problem. We will use mobile computer-assisted data collection technology equipped with global positioning system receivers to collect data on fishermen's subjective beliefs about the catch that they expect at chosen fishing sites, their navigation path and the actual fishing sites, the actual catch rate at those sites, and other relevant economic information. Data on measured beliefs and actual choice under uncertainty will be used for practical and theoretical inference.

Research questions: The natural experiment that we will study is uniquely suited to examine the cognitive processes through which individuals gather and process information, and make decisions under uncertainty. We will address the following questions: (1) How do individuals use information to form beliefs about the uncertainty they face, and how are beliefs updated as new information arrives?, (2) What is the relationship between expectations as measured by our survey instrument and actual choices of decision-makers, (3) Which decision making heuristics, if any, are used in the field by experienced (professional) decision-makers?, and (4) How prevalent is the use of biased probability assessments and judgment heuristics? In addition to these questions we will investigate the influence of social, cultural and ethnic background on processes used in search, learning and decision-making under uncertainty.

Broad Impacts of Results: The results from this study can influence future research direction in important ways. First, the study will provide empirical testing of theories of decision-making, learning and search under uncertainty in the field. Second, our results will provide new insights into expectations measurement. While the economic profession has relied primarily on revealed preference analysis, incorporating expectations measurement into the study of decision making under uncertainty may significantly improve economic modeling and prediction. Third, the results from this study will provide new knowledge about the decision-making processes and ability of *experienced* individuals operating under intense circumstances. The subjects in our study represent a (self-selected) segment of the population that is not observed in experimental studies of decision making under uncertainty. Consequently our results can verify or refute past research. The effects of experience and selection, and the cost of non-optimal decision-making under real world economic conditions, may lead to new lines of inquiry. For example, a fundamental, longer-term question is whether optimal decision-making under uncertainty can be learned and should be taught? Our analysis of the extent of non-optimal decision-making, e.g., the use of heuristics and biased subjective probability assessment, along with a measurement of their economic consequences is an important first step for addressing this broader question.

Appendix B: Confidential disclosure form

A Study of Decision-Making in Uncertain Circumstances: Learning from Alaskan Halibut Fishermen

2007

- I understand that this study is being conducted by researchers at Iowa State University, Ames, IA and the University of Alaska, Fairbanks, AK. The goal of the research is to learn more about the process of decision-making in risky or uncertain circumstances, which are characteristic of the lives and work of fishermen.
- I agree to participate in this research study voluntarily, and I understand that I will be issued a PDA and a GPS device to use for while I am participating in the study.
- I agree to install the GPS device in my boat so that it can record information relating to the movements of my boat during each halibut fishing trip. I agree to allow this information to be used **only** by the research staff **exclusively** for the purpose of this research project.
- I agree to answer a series of questions in the PDA both before and after each longline fishing trip taken during the 2007 fishing season.
- I agree to allow International Pacific Halibut Commission (IPHC) port samplers to transfer GPS data to the memory card in my PDA periodically and return the memory card to research staff at Iowa State University for analysis. I understand that IPHC port samplers will not have access to any of my recorded information.
- I understand that I will be compensated for my time in the amount of \$500 per year of participation, payable to me at the end of the halibut fishing season. I also understand that the PDA will be mine to keep after the end of the 2007 season.
- I understand that Iowa State University will keep my identity, the location of fishing sites, vessel locations and individual catch and economic information that I provide completely confidential, and that the information I provide will not be made available to anyone or any organization outside of the research staff. I understand that the purpose of the research is not to identify productive fishing locations, but to examine decision-making process used under uncertain circumstances.
- I understand that I will be asked by the IPHC to grant the research team access to trip logbook records. I understand that this information will be used for the purposes of conducting this research project only, and its confidentiality will be maintained following the protocols governing all data gathered in this project.
- I understand that, if I have questions about the rights of human subjects in research, I can contact the Research Compliance Officer, Diane Ament, 2810 Beardshear Hall, Ames, IA, 50011, (515) 294-3115; dament@iastate.edu.

I have read the above project description and agree to participate in this research study.

Name (Printed)

Name (Signature)

Date: _____

Appendix C: 2007 Threshold Calculations

Let $S(M) = 0.333 * M$ denote an estimate of the standard deviation for average pounds per skate.

What are the chances out of 100 that your average pounds per skate will be:

a. below $[T1]$ pounds? $\square\square/100$ (response = c1).

$$T1 = M - 1.65 * S(M).$$

What are the chances out of 100 that your average pounds per skate will be:

b. below $[T2]$ pounds? $\square\square/100$ (response = c2).

$$T2 = M - .75 * S(M). \quad \text{if } c1 < 5$$

$$T2 = M - S(M). \quad \text{if } 5 < c1 \leq 15$$

$$T2 = M - 1.25 * S(M). \quad \text{if } c1 > 15$$

Consistency check: $c1 \leq c2$

What are the chances out of 100 that your average pounds per skate will be:

c. above $[T3]$ pounds? $\square\square/100$ (response = c3).

$$T3 = M + 1.65 * S(M).$$

What are the chances out of 100 that your average pounds per skate will be:

d. above $[T4]$ pounds? $\square\square/100$ (response = c4).

$$T4 = M + .75 * S(M). \quad \text{if } c3 < 5$$

$$T4 = M + S(M). \quad \text{if } 5 < c3 \leq 15$$

$$T4 = M + 1.25 * S(M). \quad \text{if } c3 > 15$$

Appendix D: Pre-and post-trip questionnaire

Halibut Fishing Trip Surveys Definitions

Fishing site: *Fishing sites* are locations that are separated by vessel *steaming* time with gear out of the water. For example, the first fishing site on a trip is the location at which the first set is made since the vessel steamed from port with all gear out of the water in order to reach this location. If after making one or several sets at this first site, the gear must be completely removed from the water in order to steam to a new location, this new location will represent a distinct fishing site.

Fishing trip: A fishing trip begins when the vessel leaves port and ends when the vessel docks and the catch is sold to a fish buyer.

Sustained wind speed: the average wind speed during a period of at least 6 hours.

Trip food expenses: the cost of food and non-alcoholic beverages which were purchased for consumption by the captain and crew on the fishing trip.

This trip's fuel: the fuel that you currently have on board the vessel. If different prices per gallon were paid for the fuel on board, please estimate an average price per gallon.

Catch constrained by IFQ shares: refers to the case where the total pounds that can be harvested on the trip are constrained by the amount of quota shares.

Halibut revenues: for each size class calculate the price per pound multiplied by the number of pounds landed. Total trip revenues are the sum of revenues for each size class.

Halibut trip: a trip where you intend to catch halibut but may catch some incidental black cod.

Combination trip: a trip where you expect to catch and land a nontrivial proportion of both halibut and black cod.

Black cod trip: a trip where you intend to catch black cod but may catch some incidental halibut.

Halibut Fishing Trip Surveys

Pre-Trip Questions.

Trip.

Please record the following information for this fishing trip.

The current date and time setting on your PDA is: [Month/Day/Year, Time]. If this is not correct please reset the date and time.

1. What type of trip that you are planning:

- ☐ Halibut
- ☐ Combination Halibut/Black Cod
- ☐ Black cod

[If Black Cod Go to Page 10]

1. Date to leave port: [Calendar to select Month/Day/Year] ☐ AM ☐ PM

2. Expected length of trip days.

3. Price per gallon paid for fuel. \$

Catch.

4. Price per pound expected for: [Randomly selects two size categories.]

10-20 lb. halibut \$

20-40 lb halibut \$

40-60 lb halibut \$

60+ lb halibut \$

5. Pounds of halibut you plan to catch. (some may be over 100,000 lbs)

6. Is the trip catch constrained by IFQ shares?

- ☐ Yes
- ☐ No

Sites.

7. Number of sites you expect to set gear to catch [Q] pounds.

Options: 1, 2, 3, 4, 5 or more

[Tap on “Site Questions”]

Location.

8. Most likely location of first fishing site.

Lat : degrees minutes

Lon : degrees minutes

(Note: ask for tenth's of minutes)

9. Rate the importance of the following factors in choosing your first site.

[Items a & b appear in Location tab. Items c-g appear in Factors tab.]

		Not Important				Very Important			
a.	Caught fish past years	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
b.	Caught fish this year	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Factors.									
c.	Tip from a friend	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
d.	IPHC setline survey	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
e.	Good weather expected	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
f.	Good tides expected	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
g.	Close to fish buyer	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Setup.

10. Halibut size class you mostly expect to catch at first site.

- ☐ 10-20 lbs
- ☐ 20-40 lbs
- ☐ 40-60 lbs
- ☐ 60+ lbs

11. Number of hooks per skate you will use. (max 250, less than 1000) (What?)

12. Number of skates you are likely to set at first site. sk (max 30, less than 100) (?)

Catch.

13. Average pounds per skate you think you will catch on all [SK] skates.

pounds. (range: 100-700)

14. What are the chances out of 100 that your average pounds per skate will be:

a. below [M1*S2] pounds? C1/100 range: 0-99

b. below [M1*S1] pounds? /100 range: 0-C1

c. above [M1*S3] pounds? C3/100 range: 0-99

d. above [M1*S4] pounds? /100 range: 0-C3

Wind.

15. Highest sustained wind speed expected at first site. knots (range: 0-60 knots)

[Tap on “Second Site”]

Location.

16. If you do not catch all [Q] pounds at the first site, what is the most likely location of your second site?

Lat : degrees . minutes

Lon : degrees . minutes

[Items a & b appear in Location tab. Items c-g appear in Factors tab.]

17. Rate the importance of the following factors in choosing your second site.

		Not Important				Very Important
a.	Caught fish past years	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
b.	Caught fish this year	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Factors.						
c.	Tip from a friend	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
d.	IPHC setline survey	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
e.	Good weather expected	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
f.	Good tides expected	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
g.	Close to fish buyer	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Setup.

18. Halibut size class you mostly expect to catch at second site.

- ☐ 10-20 lbs
- ☐ 20-40 lbs
- ☐ 40-60 lbs
- ☐ 60+ lbs

19a. Number of hooks per skate you will use.

19b. Number of skates you are likely to set at second site.

Catch.

20. Average pounds per skate you think you will catch on all skates?

pounds. (range 100-500, less than 1000)

21. What are the chances out of 100 that your average pounds per skate will be:

a. below [M1*S2] pounds? C1/100 range: 0-99

b. below [M1*S1] pounds? /100 range: 0-C1

c. above [M1*S3] pounds? C3/100 range: 0-99

d. above [M1*S4] pounds? /100 range: 0-C3

Wind.

22. Highest sustained wind speed expected at second site. knots

Thank you. That's all the information needed for this trip. Please complete the post-trip questions after you return to port.

[Tap on "Finish"]

Post-Trip Questions.

Days.

Please record the following information concerning the trip you just completed.

1. Number of days at sea.

[Tap on “Continue”]

Return.

2. **[IF (Y-X) ≥ 1]** You had estimated a **[X]** day trip. How important were the following factors in delaying your return?

	Not Important				Very Important
a. Fewer fish than expected	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
b. Weather	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
c. Mechanical problem	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
d. Lost gear	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Return.

3. **[IF (Y-X) ≤ -1]** You had estimated a **[X]** day trip. How important were the following factors in your early return?

	Not Important				Very Important
a. More fish than expected	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
b. Weather	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
c. Ran out of bait	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
d. Ran out of ice	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Early2.

e. Mechanical problem	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
f. Health problem/injury	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
g. Lost gear	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

[Tap on “Continue”]

Location.

4. Your first fishing site was planned for

Lat : degrees minutes

Lon : degrees minutes

- Did you set gear at this site?
- ☐ Yes [GO TO 5]
 - ☐ No [GO TO 6]

[Tap on “Continue”]

Extra.

5. What was the highest sustained wind speed at this site? knots

[Tap on “Continue”]

Factors.

6. How important were the following factors in deciding **not** to set gear at this site?

	Not Important				Very Important
a. Weather	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
b. Tides	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
c. Another halibut boat on-site	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
d. Gear conflict	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
e. Friend said site had no fish	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
f. Whales	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Location.

7. Your second fishing site was planned for

Lat : degrees minutes

Lon : degrees minutes

- Did you set gear at this site?
- ☐ Yes [RETURN TO 5]
 - ☐ No [RETURN TO 6]

[Tap on “Continue”]

Extra.

8. Did you set gear at any sites that you did **not** originally plan to fish at?

- ☐ No [GO TO 10]
- ☐ Yes, one site [GO TO 9a]
- ☐ Yes, more than one site [GO TO 9b]

[Tap on “Continue”]

Unplanned.

9. [IF Q8 = ONE SITE:] How important were the following factors in your decision to set gear at this site?

[IF Q8 = > ONE SITE:] For the last unplanned site you fished on this trip, how important were the following factors in your decision to set gear there?

	Not Important				Very Important
a. Friend said the site had fish	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
b. Another boat catching fish at site	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
c. Site had good bottom	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
d. Weather	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

[Tap on “**Continue**”]

Price.

11. Price per pound received for:

10-20 lb halibut \$.

20-40 lb halibut \$.

40-60 lb halibut \$.

60+ lb halibut \$.

Revenue.

10. What was the highest sustained wind speed encountered on this trip? knots

13. Total halibut revenues \$,. (max: \$300,000)

14. Non-halibut revenues \$,. (max: \$100,000)

Bait.

15. Bait expenses (max: \$10,000)

Herring	\$	<input type="text"/>	<input type="text"/>	,	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	.	<input type="text"/>	<input type="text"/>	<input type="text"/>
Squid	\$	<input type="text"/>	<input type="text"/>	,	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	.	<input type="text"/>	<input type="text"/>	<input type="text"/>
Salmon	\$	<input type="text"/>	<input type="text"/>	,	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	.	<input type="text"/>	<input type="text"/>	<input type="text"/>
Cod	\$	<input type="text"/>	<input type="text"/>	,	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	.	<input type="text"/>	<input type="text"/>	<input type="text"/>
Pollock	\$	<input type="text"/>	<input type="text"/>	,	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	.	<input type="text"/>	<input type="text"/>	<input type="text"/>
Octopus	\$	<input type="text"/>	<input type="text"/>	,	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	.	<input type="text"/>	<input type="text"/>	<input type="text"/>
Other	\$	<input type="text"/>	<input type="text"/>	,	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	.	<input type="text"/>	<input type="text"/>	<input type="text"/>

Expense.

12. Gallons of fuel used. , (max: 2,000 gallons)

16. Food expenses. \$,. (up to \$1,500)

17. Cost of replacing lost gear \$,. (max: \$10,000)

Thank you. That's all the information needed for this fishing trip.
Remember to complete the pre-trip questions for your next trip before you leave port.
Thank you.

[Tap on “**Finish**”]

[If Black Cod Trip]

1. Date to leave port: [Calendar to select Month/Day/Year] ☐ AM ☐ PM

2. Expected length of trip days.

3. Price per gallon paid for fuel. \$.

Catch.

4. Price per pound expected for: [Randomly selects two size categories.]

1-2 lb. black cod \$.

2-3 lb black cod \$.

3-4 lb black cod \$.

4-5 lb black cod \$.

5-7 lb black cod \$.

7+ lb black cod \$.

5. Pounds of black cod you plan to catch. , Q (some may be over 100,000 lbs)

6. Is the trip catch constrained by IFQ shares?

☐ Yes

☐ No

Sites.

7. Number of sites you expect to set gear to catch [Q] pounds.

Options: 1, 2, 3, 4, 5 or more

[Tap on “**Site Questions**”]

Location.

8. Most likely location of first fishing site.

Lat : degrees . minutes

Lon : degrees . minutes

(Note: ask for tenth’s of minutes)

9. Rate the importance of the following factors in choosing your first site.

[Items a & b appear in Location tab. Items c-g appear in Factors tab.]

		Not Important				Very Important
a.	Caught fish past years	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
b.	Caught fish this year	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Factors.						
c.	Tip from a friend	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
d.	NMFS survey data	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
e.	Good weather expected	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
f.	Good tides expected	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
g.	Close to fish buyer	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Setup.

10. Black cod size class you mostly expect to catch at first site.

- ☐ 1-2 lbs
- ☐ 2-3 lbs
- ☐ 3-4 lbs
- ☐ 4-5 lbs
- ☐ 5-7 lbs
- ☐ 7+ lbs

11. Number of hooks per skate you will use. (max 250, less than 1000)

12. Number of skates you are likely to set at first site. SK (max 30, less than 100) (?)

Catch.

13. Average pounds per skate you think you will catch on all [SK] skates.

pounds. (range: 100-700)

14. What are the chances out of 100 that your average pounds per skate will be:

a. below [M1*S2] pounds? C1/100 range: 0-99

b. below [M1*S1] pounds? /100 range: 0-C1

c. above [M1*S3] pounds? C3/100 range: 0-99

d. above [M1*S4] pounds? /100 range: 0-C3

Wind.

15. Highest sustained wind speed expected at first site. knots (range: 0-60 knots)

[Tap on “Second Site”]

Location.

16. If you do not catch all [Q] pounds at the first site, what is the most likely location of your second site?

Lat : degrees . minutes

Lon : degrees . minutes

[Items a & b appear in Location tab. Items c-g appear in Factors tab.]

17. Rate the importance of the following factors in choosing your second site.

	Not Important				Very Important
a. Caught fish past years	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
b. Caught fish this year	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Factors.

c. Tip from a friend	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
d. NMFS Survey data	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
e. Good weather expected	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
f. Good tides expected	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
g. Close to fish buyer	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Setup.

18. Black cod size class you mostly expect to catch at first site.

- ☐ 1-2 lbs
- ☐ 2-3 lbs
- ☐ 3-4 lbs
- ☐ 4-5 lbs
- ☐ 5-7 lbs
- ☐ 7+ lbs

19a. Number of hooks per skate you will use.

19b. Number of skates you are likely to set at second site. (less than 1000)

Catch.

20. Average pounds per skate you think you will catch on all skates?

pounds. (range 100-500, less than 1000)

21. What are the chances out of 100 that your average pounds per skate will be:

a. below [**M1*S2**] pounds? **C1**/100 range: 0-99

b. below [**M1*S1**] pounds? /100 range: 0-C1

c. above [**M1*S3**] pounds? **C3**/100 range: 0-99

d. above [**M1*S4**] pounds? /100 range: 0-C3

Wind.

22. Highest sustained wind speed expected at second site. knots

Thank you. That's all the information needed for this trip. Please complete the post-trip questions after you return to port.

[Tap on "**Finish**"]

Post-Trip Questions.

Days.

Please record the following information concerning the trip you just completed.

1. Number of days at sea.

[Tap on “Continue”]

Return.

2. **[IF $(Y-X) \geq 1$]** You had estimated a **[X]** day trip. How important were the following factors in delaying your return?

	Not Important				Very Important
a. Fewer fish than expected	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
b. Weather	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
c. Mechanical problem	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
d. Lost gear	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Return.

3. **[IF $(Y-X) \leq -1$]** You had estimated a **[X]** day trip. How important were the following factors in your early return?

	Not Important				Very Important
a. More fish than expected	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
b. Weather	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
c. Ran out of bait	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
d. Ran out of ice	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Early2.

e. Mechanical problem	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
f. Health problem/injury	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
g. Lost gear	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

[Tap on “Continue”]

Location.

4. Your first fishing site was planned for

Lat : degrees minutes

Lon : degrees minutes

- Did you set gear at this site?
- ☐ Yes [GO TO 5]
 - ☐ No [GO TO 6]

[Tap on “Continue”]

Extra.

5. What was the highest sustained wind speed at this site? knots

[Tap on “Continue”]

Factors.

6. How important were the following factors in deciding **not** to set gear at this site?

	Not Important				Very Important
a. Weather	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
b. Tides	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
c. Another longline boat on-site	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
d. Gear conflict	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
e. Friend said site had no fish	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
f. Whales	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Location.

7. Your second fishing site was planned for

Lat : degrees minutes

Lon : degrees minutes

- Did you set gear at this site?
- ☐ Yes [RETURN TO 5]
 - ☐ No [RETURN TO 6]

[Tap on “Continue”]

Extra.

8. Did you set gear at any sites that you did **not** originally plan to fish at?

- ☐ No [GO TO 10]
- ☐ Yes, one site [GO TO 9a]
- ☐ Yes, more than one site [GO TO 9b]

[Tap on “Continue”]

Unplanned.

9. [IF Q8 = ONE SITE:] How important were the following factors in your decision to set gear at this site?

[IF Q8 = > ONE SITE:] For the last unplanned site you fished on this trip, how important were the following factors in your decision to set gear there?

	Not Important				Very Important
a. Friend said the site had fish	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
b. Another boat catching fish at site	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
c. Site had good bottom	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
d. Weather	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

[Tap on “Continue”]

Price.

11. Price per pound received for:

1-2 lb. black cod \$
 2-3 lb black cod \$
 3-4 lb black cod \$
 4-5 lb black cod \$
 5-7 lb black cod \$
 7+ lb black cod \$

Revenue.

10. What was the highest sustained wind speed encountered on this trip? knots

13. Total black cod revenue \$, . (max: \$300,000)

14. All other revenue \$, . (max: \$100,000)

Bait.

15. Bait expenses (max: \$10,000)

Herring	\$	<input type="text"/>	<input type="text"/>	,	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	.	<input type="text"/>	<input type="text"/>	<input type="text"/>
Squid	\$	<input type="text"/>	<input type="text"/>	,	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	.	<input type="text"/>	<input type="text"/>	<input type="text"/>
Salmon	\$	<input type="text"/>	<input type="text"/>	,	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	.	<input type="text"/>	<input type="text"/>	<input type="text"/>
Cod	\$	<input type="text"/>	<input type="text"/>	,	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	.	<input type="text"/>	<input type="text"/>	<input type="text"/>
Pollock	\$	<input type="text"/>	<input type="text"/>	,	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	.	<input type="text"/>	<input type="text"/>	<input type="text"/>
Octopus	\$	<input type="text"/>	<input type="text"/>	,	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	.	<input type="text"/>	<input type="text"/>	<input type="text"/>
Other	\$	<input type="text"/>	<input type="text"/>	,	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	.	<input type="text"/>	<input type="text"/>	<input type="text"/>

Expense.

12. Gallons of fuel used. , (max: 2,000 gallons)

16. Food expenses. \$,. (up to \$1,500)

17. Cost of replacing lost gear \$,. (max: \$10,000)

Thank you. That's all the information needed for this fishing trip.
Remember to complete the pre-trip questions for your next trip before you leave port.
Thank you.

[Tap on “**Finish**”]

